Joshua A. White

Group Leader
Subsurface Transport Group
Atmospheric, Earth, and Energy Division
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Education

- Stanford University, Ph.D. in Civil and Environmental Engineering, Aug. 2009
  Ph.D. Minor, Stanford Institute for Computational and Mathematical Engineering
  Dissertation: *Stabilized finite element methods for coupled flow and geomechanics*
- Stanford University, M.S. in Civil and Environmental Engineering, June 2007
- Princeton University, B.S.E. in Civil and Environmental Engineering, High Honors, June 2004

Employment History

- Group Leader, Subsurface Transport Group, LLNL, Oct. 2016 to present
- Research Scientist, Lawrence Livermore National Laboratory, Sept. 2012 to present
- Lawrence Postdoctoral Fellow, Lawrence Livermore National Laboratory, Sept. 2009 to Aug. 2012
- Summer Internship, BP America, June to September 2007
- Summer Internships, Sandia National Laboratory, June to September, 2005 and 2006

Research Interests

My research focuses on integrating field monitoring techniques with large-scale computing to improve our understanding of complex geologic systems. Applications of interest include geologic carbon sequestration, unconventional energy production, and induced seismicity.

Journal Publications

1. N. Castelletto, **J.A. White**, and M. Ferronato. Scalable and efficient algorithms for three-field mixed finite element coupled poromechanics. *J. Comp. Phys.*, 327:894-918, 2016.
2. S. Semnani, **J.A. White**, R.I. Borja. Thermo-plasticity and strain localization in transversely isotropic materials based on anisotropic critical state plasticity. *Int. J. Numer. Analy. Meth. Geomech.* DOI: 10.1002/nag.2536, 2016.
3. R.R. Settgast, P. Fu, S.D.C. Walsh, **J.A. White**, C. Annavarapu, and F.J. Ryerson. A fully coupled method for massively parallel simulation of hydraulically driven fractures in 3-dimensions. *Int. J. Numer. Analy. Meth. Geomech.* DOI: 10.1002/nag.2557.
4. T.A. Buscheck, J.M. Bielicki, **J.A. White**, Y. Sun, Y. Hao, W.L Bourcier, S.A. Carroll, and R.D. Aines. Pre-injection brine production in CO_2 storage reservoirs: An approach to augment the development,

operation, and performance of CCS while generating water. *Int. J. Greenhouse Gas Control*, 2016. DOI: http://dx.doi.org/10.1016/j.ijggc.2016.04.018

5. **J.A. White** & W. Foxall. Assessing induced seismicity risk at CO_2 storage projects. Recent progress and remaining challenges. *Int. J. Greenhouse Gas Control*, 49:413-424, 2016.
6. **J.A. White**, A.K. Burnham, and D.W. Camp. A thermoplasticity model for oil shale. *Rock Mech. Rock Eng.* 2016, DOI:10.1007/s00603-016-0947-7.
7. **J.A. White**, N. Castelletto, and H.A. Tchelepi. Block-partitioned solvers for coupled poromechanics: A unified framework. *Comp. Meth. Appl. Mech. Eng.* 303:55-57, 2016.
8. T.A. Buscheck, **J.A. White**, S.A. Carroll, J.M. Bielicki, and R.D. Aines. Managing geologic CO_2 storage with pre-injection brine production: A strategy evaluated with a model of CO_2 injection at Snøhvit. *Energy & Environmental Science*. DOI: 10.1039/C5EE03648H, 2016.
9. J. Choo, **J.A. White**, and R.I. Borja. Hydromechanical modeling of unsaturated flow in double porosity media. *ASCE Int. J. Geomechanics*. DOI: 10.1061/(ASCE)GM.1943-5622.0000558, 2016
10. N. Castelletto, **J.A. White**, and H.A. Tchelepi. Accuracy and convergence properties of the fixed-stress iterative solution of two-way coupled poromechanics. *Int. J. Numer. Analy. Meth. Geomech.* doi:10.1002/nag.2400, 2015.
11. R. Pawar, G. Bromhal, W. Carey, W. Foxall, A. Korre, P. Ringrose, O. Tucker, M. Watson, and **J.A.White**. Recent advances in risk assessment and risk management of geologic CO_2 storage. *Int. J. Greenhouse Gas Control.* 40:292-311, 2015.
12. L. Chiaramonte, **J.A. White**, and W. Trainor-Guitton. Probabilistic geomechanical analysis of compartmentalization at the Snøhvit CO_2 Storage Project. *J. Geophysical Research: Solid Earth* 120(2):1195-1209, 2015.
13. D.I. Singham, W. Cai, and **J.A. White**. Optimal carbon capture and storage contracts using historical CO_2 emissions levels. *Energy Systems* DOI: 10.1007/s12667-015-0142-z, 2015.
14. **J.A. White**, L. Chiaramonte, S. Ezzedine, W. Foxall, Y. Hao, A. Ramirez, and W. McNab. Geomechanical behavior of the reservoir and caprock system at the In Salah CO_2 Storage Project, *Proceedings of the National Academy of Sciences* 111(24):8747-8752, 2014.
15. **J.A. White**. Anisotropic damage of rock joints during cyclic loading: Constitutive framework and numerical integration. *Int. J. Numer. Analy. Meth. Geomech* 28(10):1036-1057, 2014.
16. W. Cai, D.I. Singham, E.M. Craparo, and **J.A. White**. Pricing contracts under uncertainty in a carbon capture and storage framework. *Energy Economics* 43:56-62, 2014.
17. R. Mellors, X. Yang, **J.A. White**, A. Ramirez, J. Wagoner, D.W. Camp. Advanced geophysical underground coal gasification monitoring, *Mitigation and Adaption Strategies for Global Climate Change,* DOI: 10.1007/s11027-014-9584-1, 2014.
18. M. Chen, T.A. Buscheck, J.L. Wagoner, Y. Sun, **J.A. White**, L. Chiaramonte, and R. Aines. Analysis of fault leakage from the Leroy Underground Gas Storage Facility, Wyoming, USA. *Hydrogeology* 21(7):1429-1445, 2013.
19. M. Chen, Y. Sun, T.A. Buscheck, Y. Hao, **J.A. White**, and L. Chiaramonte. Uncertainty quantification of CO_2 leakage through a fault with multiphase and nonisothermal effects, *Greenhouse Gases: Sci. & Tech.,* 2(6):445-459, 2012.
20. R.I. Borja, X. Liu, and **J.A. White**. Multiphysics hillslope processes triggering landslides, *Acta Geotechnica* 7(4):261-269, 2012.
21. R.I. Borja, **J.A. White**, X. Liu, and W. Wu. Factor of safety in a partially-saturated slope inferred from hydromechanical continuum modeling, *Int. J. Numer. Anal. Meth. Geomech*. 36(2):236-248, 2012.
22. **J.A. White** and R.I. Borja. Block-preconditioned Newton-Krylov solvers for fully coupled flow and geomechanics, *Comp. Geosciences* 15(4):647-659, 2011.
23. R.I. Borja and **J.A. White**. Continuum deformation and stability analysis of a steep hillside slope under rainfall infiltration, *Acta Geotechnica* 5(1):1-14, 2010.
24. Y.L. Young, **J.A. White**, H. Xiao, and R.I. Borja. Liquefaction potential of coastal slopes induced by solitary waves, *Acta Geotechnica* 4(1):17-34, 2009.
25. **J.A. White** and R.I. Borja. Stabilized low-order finite elements for coupled solid-deformation/fluid-diffusion and their application to fault-zone transients. *Comp. Meth. Appl. Mech. Engrg.* 197(49):4353-4366, 2008.

26. **J.A. White**, R.I. Borja, and J.T. Fredrich. Calculating the effective permeability of sandstone with multiscale lattice Boltzmann/finite element simulations, *Acta Geotechnica* 1(4):195-209, 2006.
27. M. Barelli, **J.A. White**, and D.P. Billington. History and aesthetics of the Bronx-Whitestone Bridge, *ASCE J. Bridge Engineering* 11:230-241, 2006.

Book Chapters and Selected Technical Reports

1. Interagency Task Force on Natural Gas Safety. *Ensuring Safe and Reliable Underground Natural Gas Storage.* U.S. Dept. of Energy and Dept. of Transportation, Washington DC, 91pp, October 2016. URL: http://energy.gov/sites/prod/files/2016/10/f33/Ensuring%20Safe%20and%20Reliable%20Underground%20Natural%20Gas%20Storage%20-%20Final%20Report.pdf
2. R.I. Borja, J. Choo, and **J.A. White**. Rock moisture dynamics, preferential flow, and the stability of hillside slopes. Chapter 20 in *Multi-hazard Approaches in Civil Infrastructure Engineering*, P. Gardoni and J.M. LaFave (eds). Springer, Switzerland, 2016. DOI: DOI 10.1007/978-3-319-29713-2_20
3. D.W. Camp and **J.A. White**. *Underground Coal Gasification: Water-Quality Hazards and Risk Mitigation Strategies.* LLNL-TR-668663, 134pp, prepared for: Working Group on Underground Coal Gasification, Office of Surface Mining Reclamation and Enforcement, U.S. Dept. of the Interior. March 2015.
4. **J.A. White**, W. Foxall, C. Bachmann, T.M. Daley, and L. Chiaramonte. *Induced Seismicity and Carbon Storage: Risk Assessment and Mitigation Strategies*. National Risk Assessment Partnership Technical Report Series, U.S. Department of Energy, 62 pp, August 2014.
5. R.I. Borja and **J.A. White**. Conservation laws for coupled hydromechanical processes in unsaturated porous media: Theory and implementation, Chapter 8 in: *Mechanics of Unsaturated Geomaterials*, L. Laloui (Ed.) ISTE Ltd. and John Wiley & Sons, 185-208, 2010.

Research Grants

- J.A. White (PI). Pressure analysis toolkit. Jointly funded by Statoil and DOE Office of Fossil Energy, Carbon Sequestration Program. $450 k / 3 years. 2016-2018.
- J.A. White (LLNL PI). Total/Stanford/LLNL collaboration on oilshale geomechanics. Total S.A. $300 k / 2 years to LLNL. 2015-2016.
- J.A. White (PI). Microseismic processing for hazardous fault detection at carbon sequestration sites. DOE Office of Fossil Energy, Carbon Sequestration Program. $1.3 million / 3 years. 2014-2016.
- J.A. White (PI). Thermoplastic behavior of illitic oil shale. American Shale Oil. $132k / 8 months. 2014.
- L. Chiaramonte and J.A. White (PIs). Snøhvit CO_2 Storage Project: Understanding the Role of Injection-Induced Mechanical Deformation. Jointly funded by Statoil and DOE Office of Fossil Energy, Carbon Sequestration Program. $1 million / 2 years, 2013-2014.
- J.A. White (PI). Underground coal gasification: Water-quality hazards and risk mitigation strategies. Office of Surface Mining Reclamation and Enforcement Applied Science Program, $200k / 2 years. 2011-2012.

Honors and Awards

- Invited to participate in the 2015 National Academy of Engineering Frontiers of Engineering Symposium
- Excellence in Publication Award from the Deputy Director for Science & Technology, LLNL, 2015
- Directorate Gold Award to the GEOS development team, LLNL, 2014.
- Directorate Award to the Carbon Management Program for excellence in publishing, LLNL, 2013.
- Best Poster Award, Postdoc Poster Symposium, Atmospheric Earth and Energy Division, LLNL, 2012

- Spot Award, in recognition of technical contributions to the Carbon Management Program, Atmospheric Earth and Energy Division, LLNL, 2012
- Spot Award, for exceptional presentation to the Physical and Life Sciences External Review Committee, Atmospheric Earth and Energy Division, LLNL, 2010
- Lawrence Postdoctoral Fellowship, September 2009 to 2012.
- Outstanding Student Paper Award, Hydrology Section: Coupled finite element modeling of landslide initiation in variably saturated slopes, AGU Fall Meeting, San Francisco, 2008
- Outstanding Student Paper Award, Tectonophysics Section: Stabilized low-order finite elements for simulating coupled deformation and fluid flow in fault zones, AGU Fall Meeting, San Francisco, 2007
- Centennial Teaching Assistant Award, Stanford University, 2007
- National Science Foundation Graduate Research Fellowship, 2006
- Stanford University Graduate Research Fellowship, 2004
- Outstanding Undergraduate Thesis in Structural Engineering Prize, Princeton, 2004: Aerodynamic stability of multi-box suspension bridge decks

Professional Activities

- Member, U.S. DOE and DOT Interagency Task Force on Natural Gas Safety, May to October, 2016.
- Member, California Department of Oil, Gas, and Geothermal Resources National Laboratory Advisory Group on Natural Gas Storage, May 2016.
- Working Group Lead, Induced Seismicity Working Group, National Risk Assessment Partnership. The working group consists of ~15 scientists across the DOE laboratories with broad expertise in seismology, reservoir engineering, geomechanics, monitoring, and risk assessment. 2013-present.
- Reviewer, Lab-Wide Proposal Committee, Laboratory Directed Research and Development Program, Lawrence Livermore National Laboratory, 2015-2017.
- Briefed staffer from the U.S. Senate Energy & Natural Resources Committee on induced seismicity, March 2016.
- Dinner speaker, Center for Gas Separations (a DoE Energy Frontiers Research Center) Annual Meeting, Berkeley, 2015.
- Invited presentation at the Gordon Research Conference on Carbon Capture and Storage, Stonehill, MA, May 2015.
- Reviewer, Early Career Research Program Proposals, DOE Office of Science, Basic Energy Sciences, Geosciences Program, 2015.
- Reviewer for a National Research Council report, *Review of the Florida Aquifer Storage and Recovery Regional Study Technical Data Report*, associated with Florida's Comprehensive Everglades Restoration Plan.
- Session organizer (with N. Castelletto and J. Kim) of "Computational modeling for coupled poromechanics in subsurface processes," SIAM Geosciences Conference, Stanford, CA, June 2015.
- Scientific committee, Engineering Mechanics Institute Conference, Stanford, CA, 2014. Also, session organizer (with E. Dunham and T. Lin) of "Computational methods for modeling faults, fault zone processes, and seismic hazards."
- Invited participant, Total Workshop on Geomechanics, Pau, France, April 2015.
- Invited seminar, Civil and Environmental Engineering, Massachusetts Institute of Technology, March 2015.
- Invited seminar, Civil and Environmental Engineering, U. Florida, November 2014.
- Invited seminar, Energy Resources Engineering, Stanford University, October 2014.
- Invited seminar, Lawrence Berkeley National Laboratory, October 2014.
- Briefed two committees of the National Research Council on "Critical Issues in the Subsurface: Using Field Observatories and Data to Advance Understanding of Rock Behavior." Washington DC, October 2014.

- Briefed House and Senate Congressional Staff on Carbon Capture and Storage, Washington DC, July 2014.
- Briefed JASON group on subsurface state-of-stress estimation as part of the DOE Subsurface Technology and Engineering Research (SubTER) Program, La Jolla, June 2014.
- Session organizer (with W. Ehlers) of "Geomechanics and fracking," Computational Methods in Water Resources XX, Stuttgart, June 2014.
- In Salah research featured in *Christian Science Monitor* interview, May 2014.
- Briefed regulators and state officials on induced seismicity concerns related to California's SB4 well stimulation law, Oakland, February 2014.
- Invited seminar, Civil and Environmental Engineering Dept., Stanford University, Jan. 2014.
- Participated in DOE, DOI, and EPA inter-agency discussions on induced seismicity resulting from oil & gas development and waste-fluid disposal, January-February 2014.
- Underground coal gasification water-quality hazards research featured in several news articles: *National Geographic Online* Apr. 2014, *NPR/Wyoming Public Radio* Nov. 2014, *Platts Coal Outlook* Jan 2013, and *Alaska Business Monthly* Aug. 2013.
- Reviewer, Laboratory Directed Research and Development Program, Lawrence Livermore National Laboratory, 2012.
- Organizing Committee, International Workshop on Multiscale and Multiphysics Processes in Geomechanics, Stanford, CA, June 2010.
- Reviewer for Acta Geotechnica, Computational Geosciences, Earth and Planetary Science Letters, Engineering Geology, Geophysics, International Journal for Numerical and Analytical Methods in Geomechanics, International Journal of Greenhouse Gas Control, Mine Water Engineering, Seismological Research Letters, and Water Resources Research.

Mentoring Activities

- *Postdoc:* Wei Wang (2014-present), Kayla Kroll (2016-present)
- *Summer Students:* Shabnam Semnani (Stanford, 2014-2016), Xiaoyu Song (Stanford, 2014).